

# VCERC Offshore Wind Study Implications for Permit by Rule in State Waters

Briefing to

## DEQ Regulatory Advisory Panel

Richmond, VA  
07 July 2010



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# VCERC Offshore Wind Project 1: Commercial Feasibility Assessment



# Initial VCERC Projects Funded by State Budget in FY2007-08



Old Dominion UNIVERSITY

1. Feasibility-level design and economic assessment for a hypothetical reference baseline offshore wind power project



VIMS  
*Virginia INSTITUTE of MARINE SCIENCE*

2. Preliminary mapping of offshore areas suitable for offshore wind power development, with identification of military training areas, shipping lanes, commercial fishing grounds, and marine and avian habitats



NSU  
NORFOLK STATE UNIVERSITY

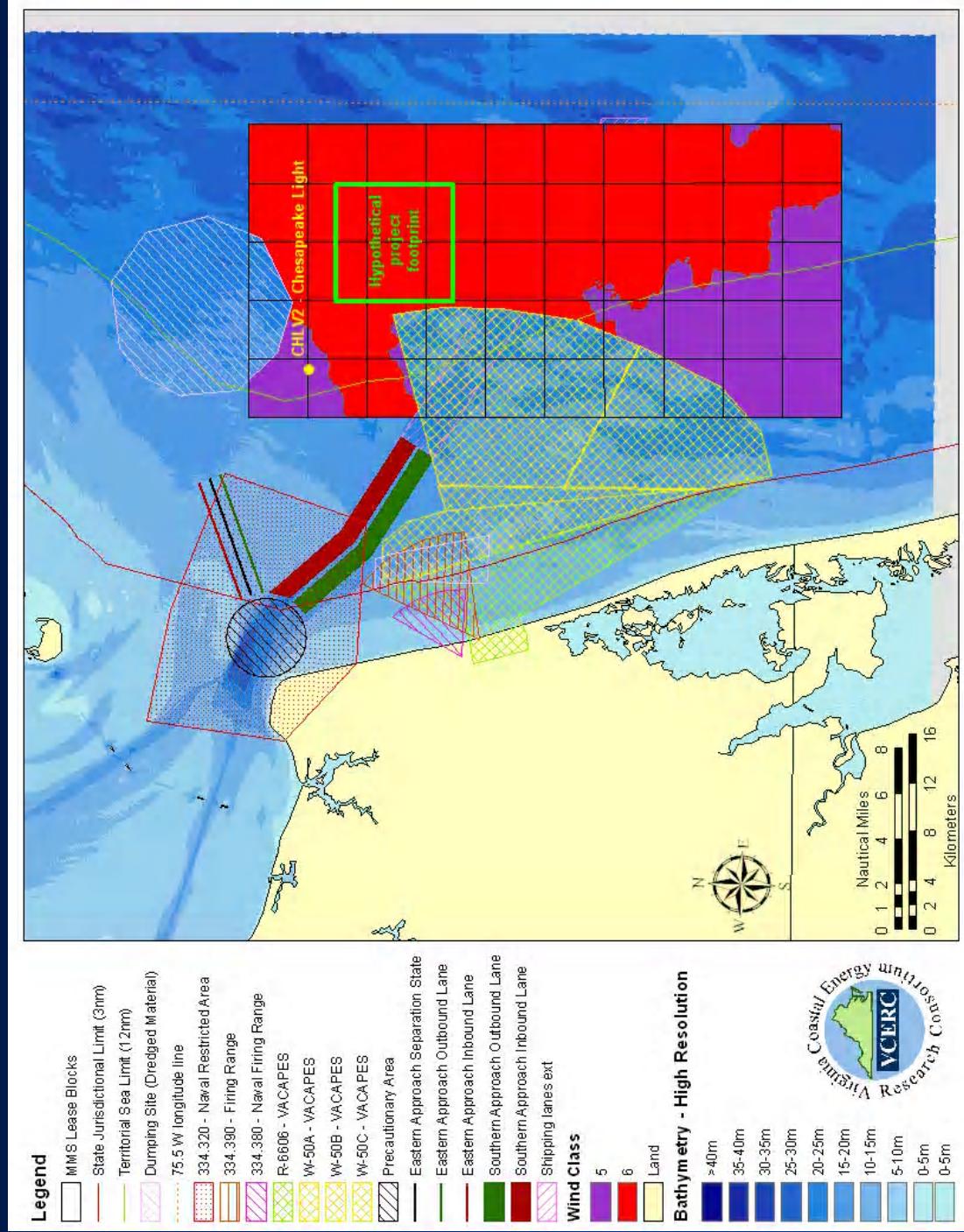
3. Evaluation of economic development potential of commercial offshore wind power development and associated workforce training needs, and planning for an ocean test bed



Paliria Energy, Inc.

4. Feasibility-level design and economic assessment for an algae-to-biodiesel culture and processing system

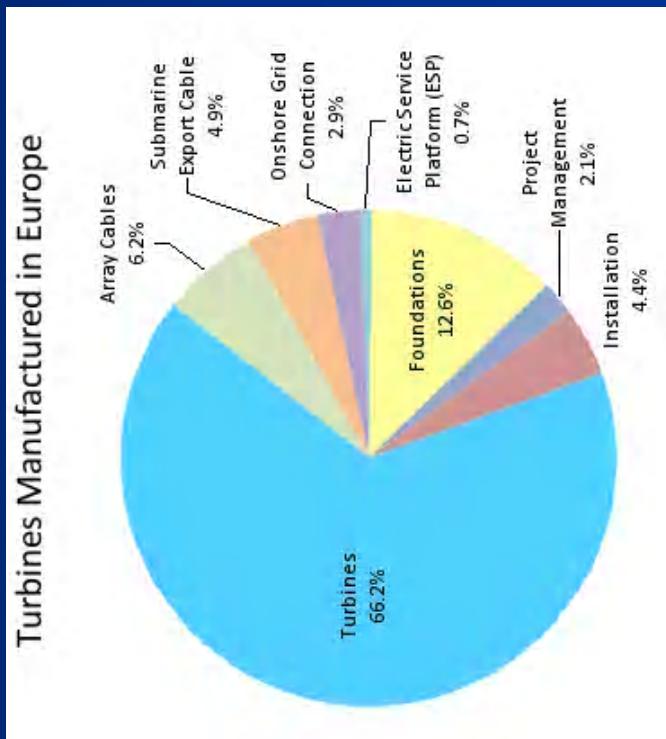
# VCERC Project 1: Feasibility-Level Design and Economic Assessment



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Capital cost estimated in March 2008 dollars using NREL parametric model for wind turbine & tower, Virginia maritime supplier bids for foundations & installation, and published data for balance of plant

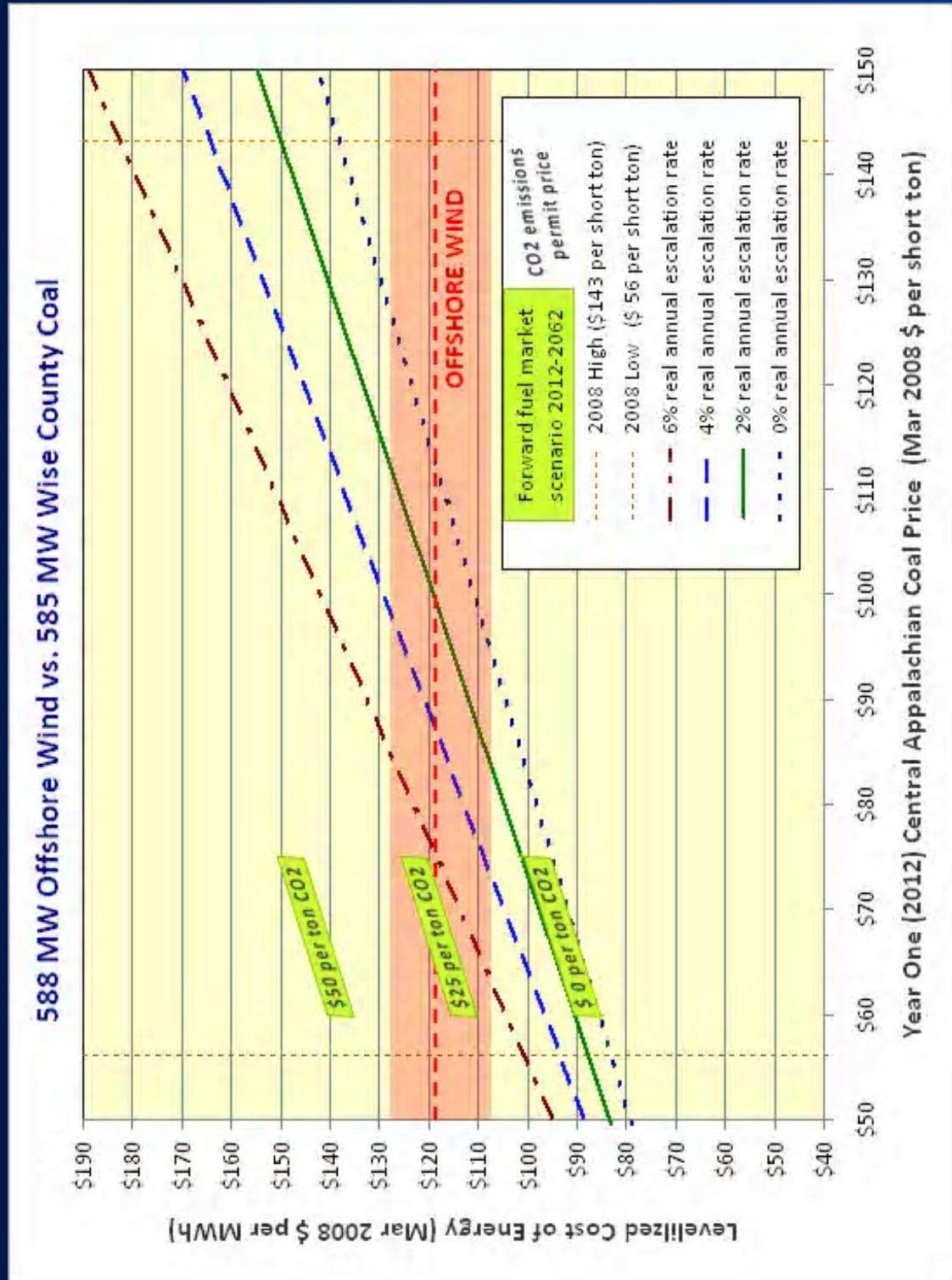
- *Plant cost at offshore busbar* : \$ 1,763 million
- *Transmission cost to Fentress* : \$ 153 million
- *Total plant investment* : \$ 1,916 million (~ \$3,260 / kW)



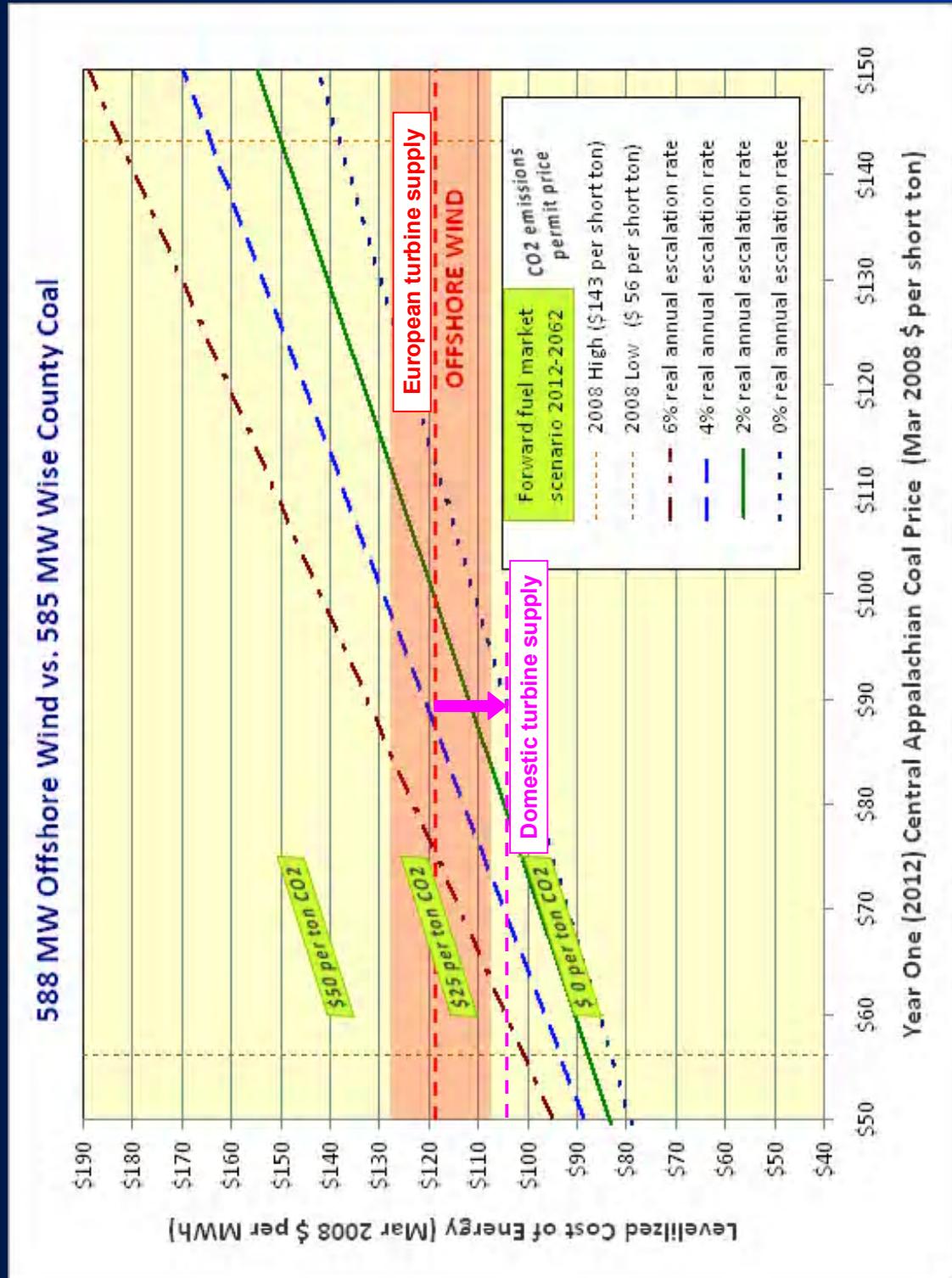
588 MW installed  
rated capacity  
(7 x 7 turbines  
per lease block)

38% annual  
capacity factor  
20% PJM  
capacity factor  
(peak hours)

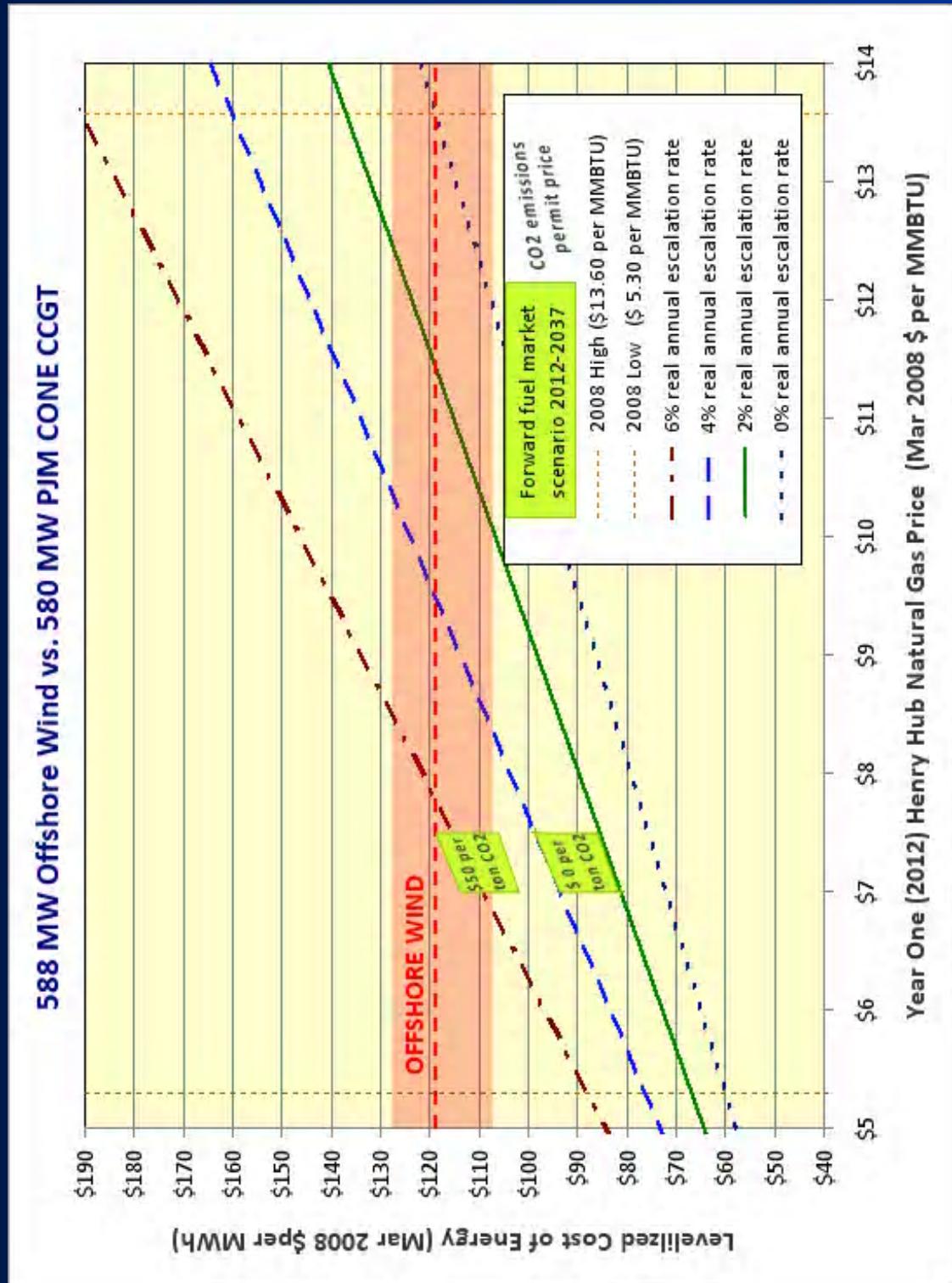
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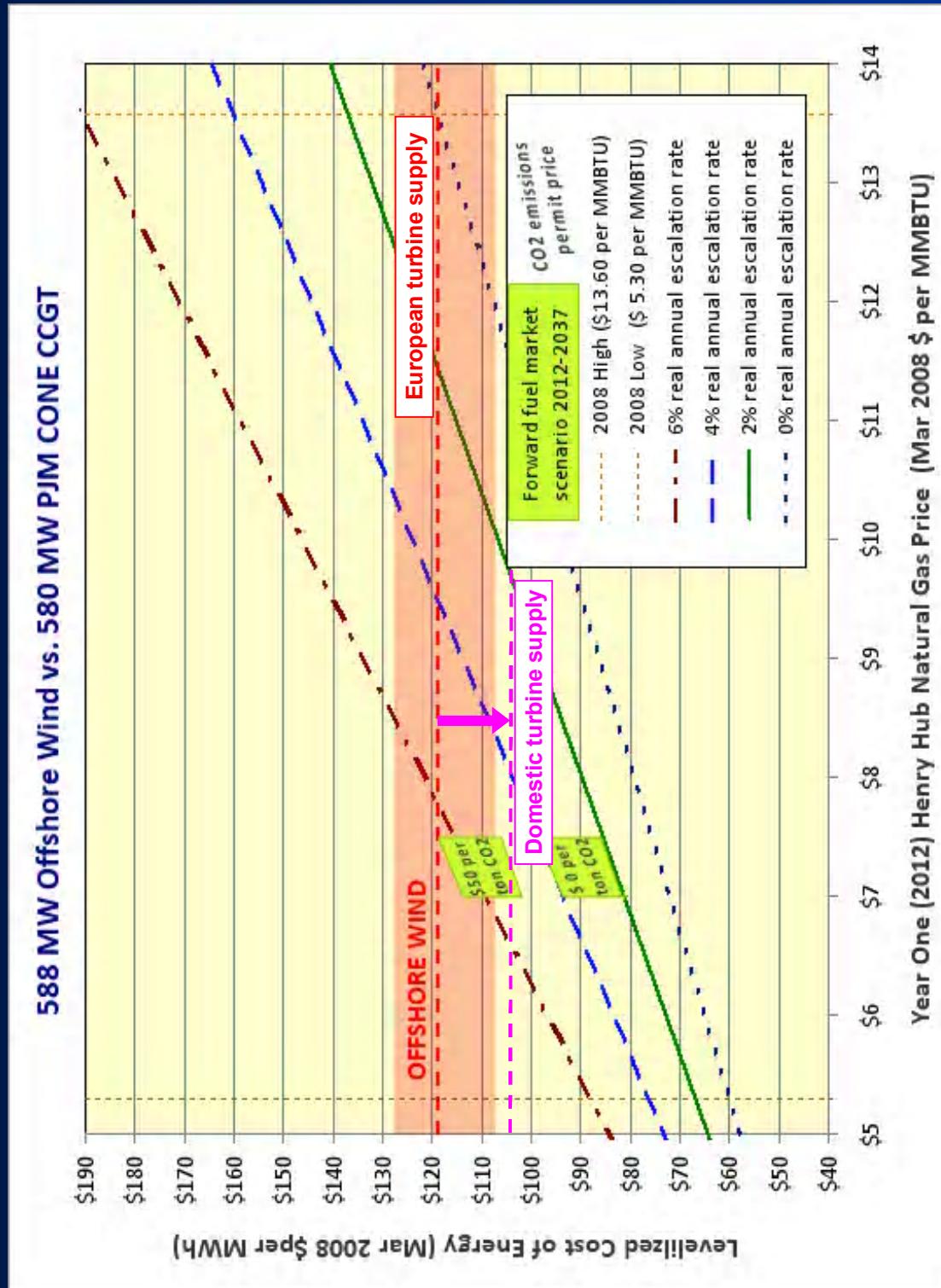
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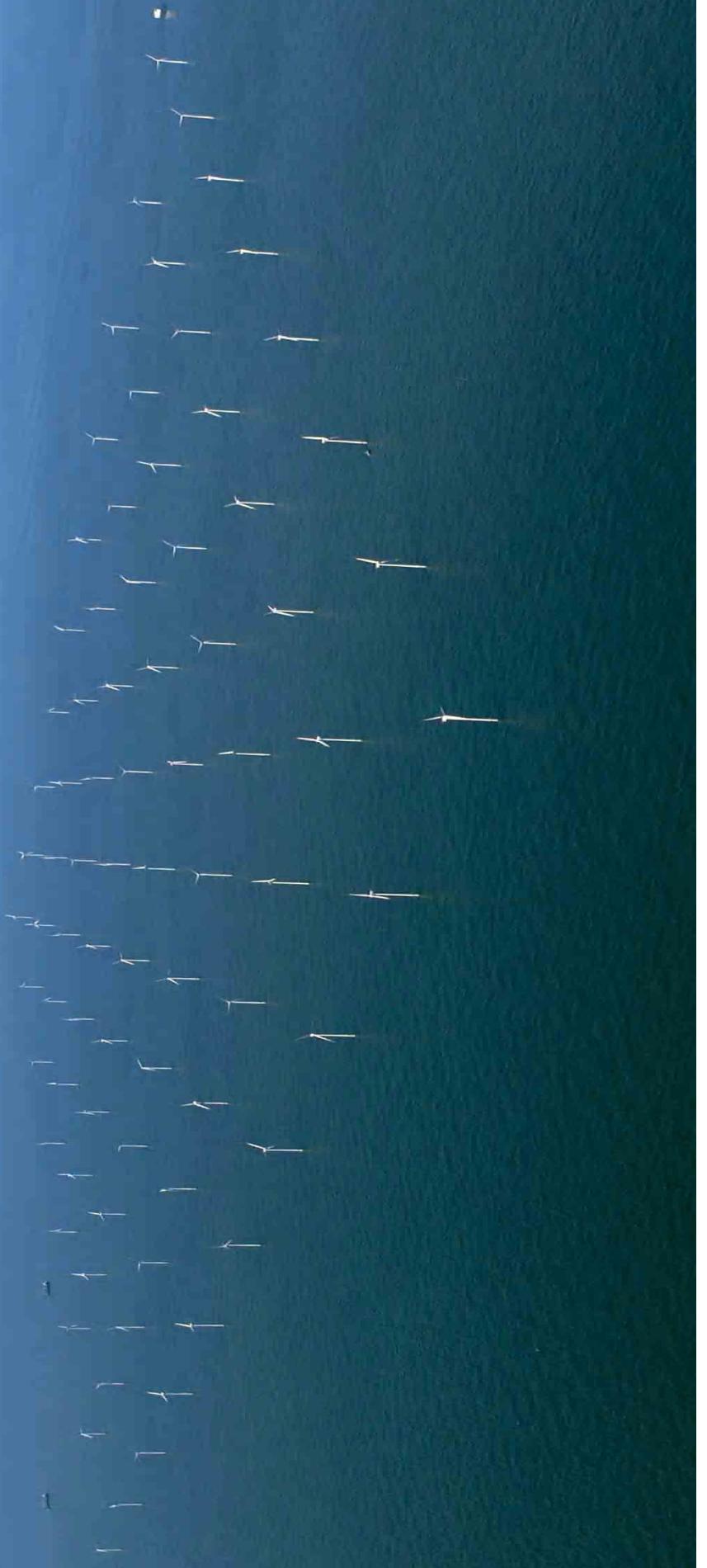
# Virginia Offshore Wind Development Authority Established to Provide Enabling Infrastructure



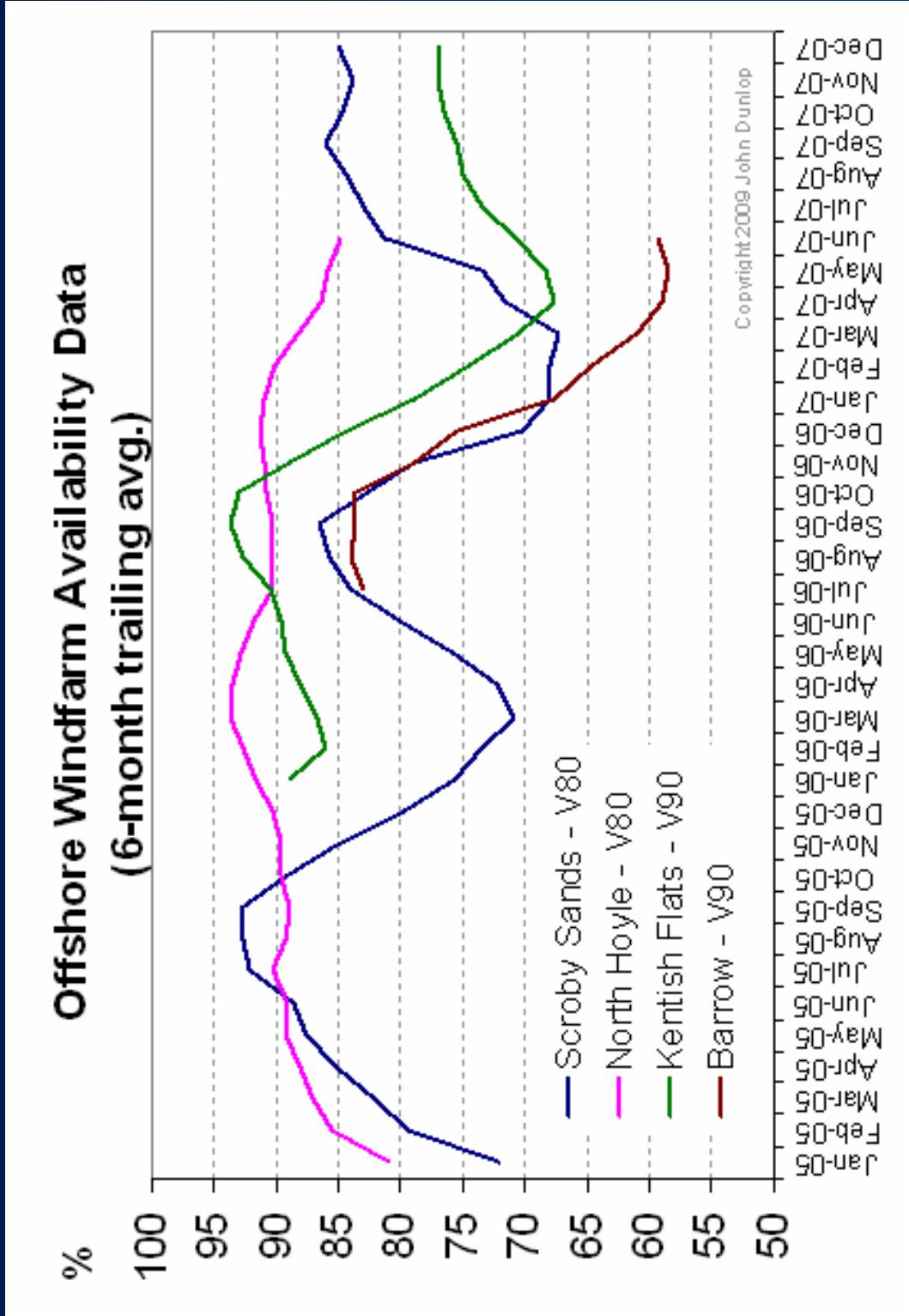
Before making a **~\$2 billion investment**  
(as would be needed for a 600 MW project in  
federal waters) or a **\$500 million investment**  
in a Hampton Roads turbine manufacturing  
complex, **full-scale offshore testing must  
be done** (costing **\$60-75 million** over 5 yrs)



# **Need for Staged National Offshore Wind Test Center**



# Reliability of Turbines Needs to be Proven in Full-Scale Demonstration Project



# Navy and DoD Issues also can be Addressed by Full-Scale Demonstration

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Offshore wind power represents the single largest renewable energy resource available to DoD facilities on the U.S. eastern seaboard

*Can make a substantial contribution towards DoD goal of achieving training range sustainability and meeting SecNav 50% renewable energy 2025 goal*

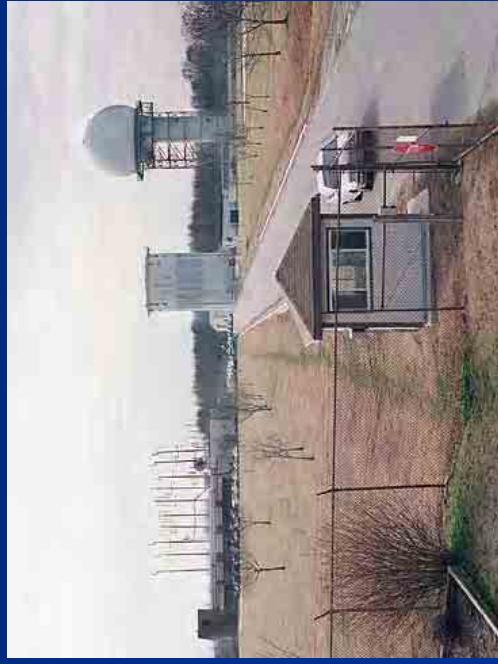
Need to qualify wind turbines for use in VACAPES, and a full-scale turbine demonstration project in state waters would be a key first step

DoD would benefit from a full-scale demonstration with a large-diameter turbine rotor at a location with potential exposure to a variety of radars

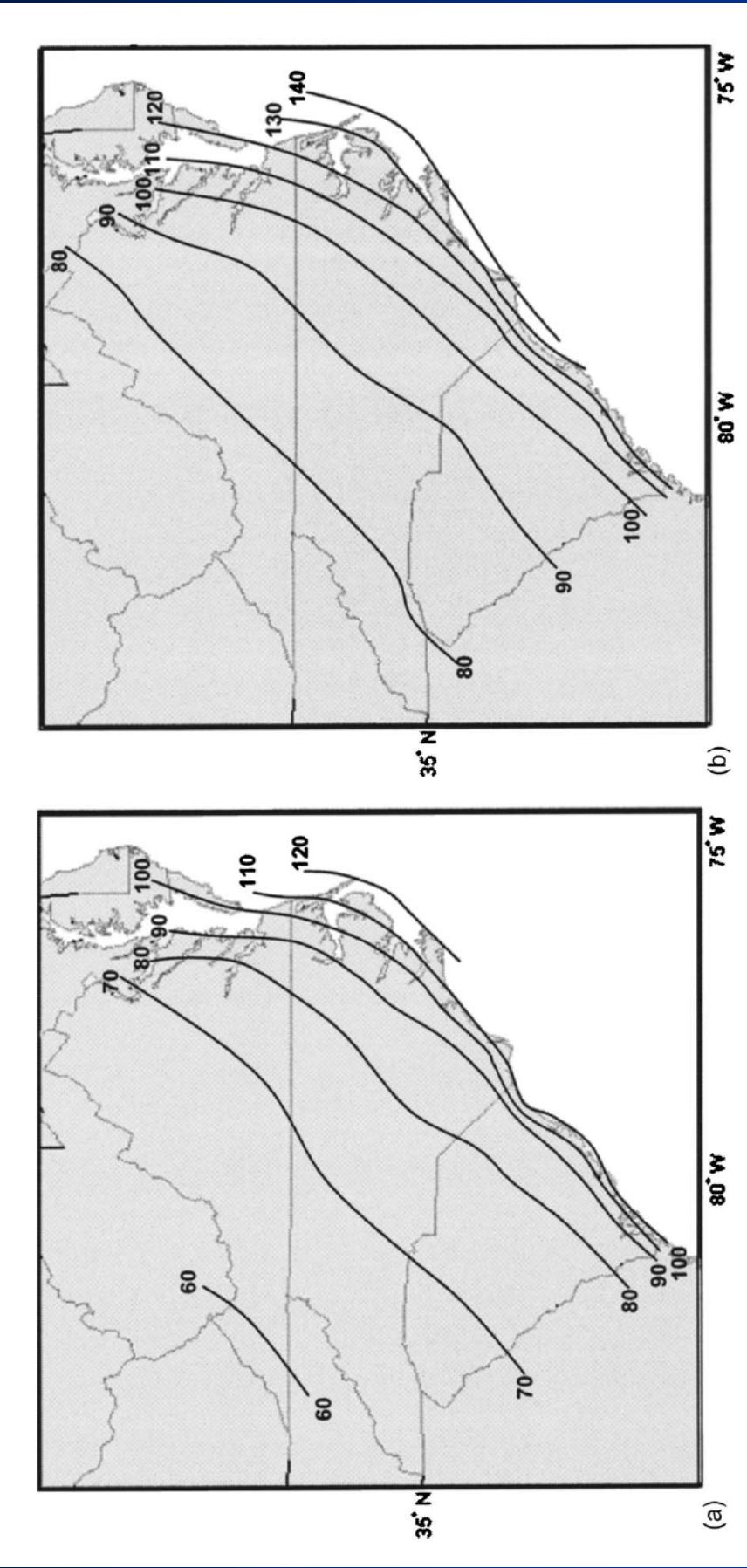
*Full-scale Doppler measurements to feed into numerical simulations of radar signatures for large offshore projects*

*Demonstrate mitigation technologies (coatings, radar-trapping blade laminate construction)*

*Such qualification would have NWS, FAA, DHS, and DoD-wide (not just Navy) implications*

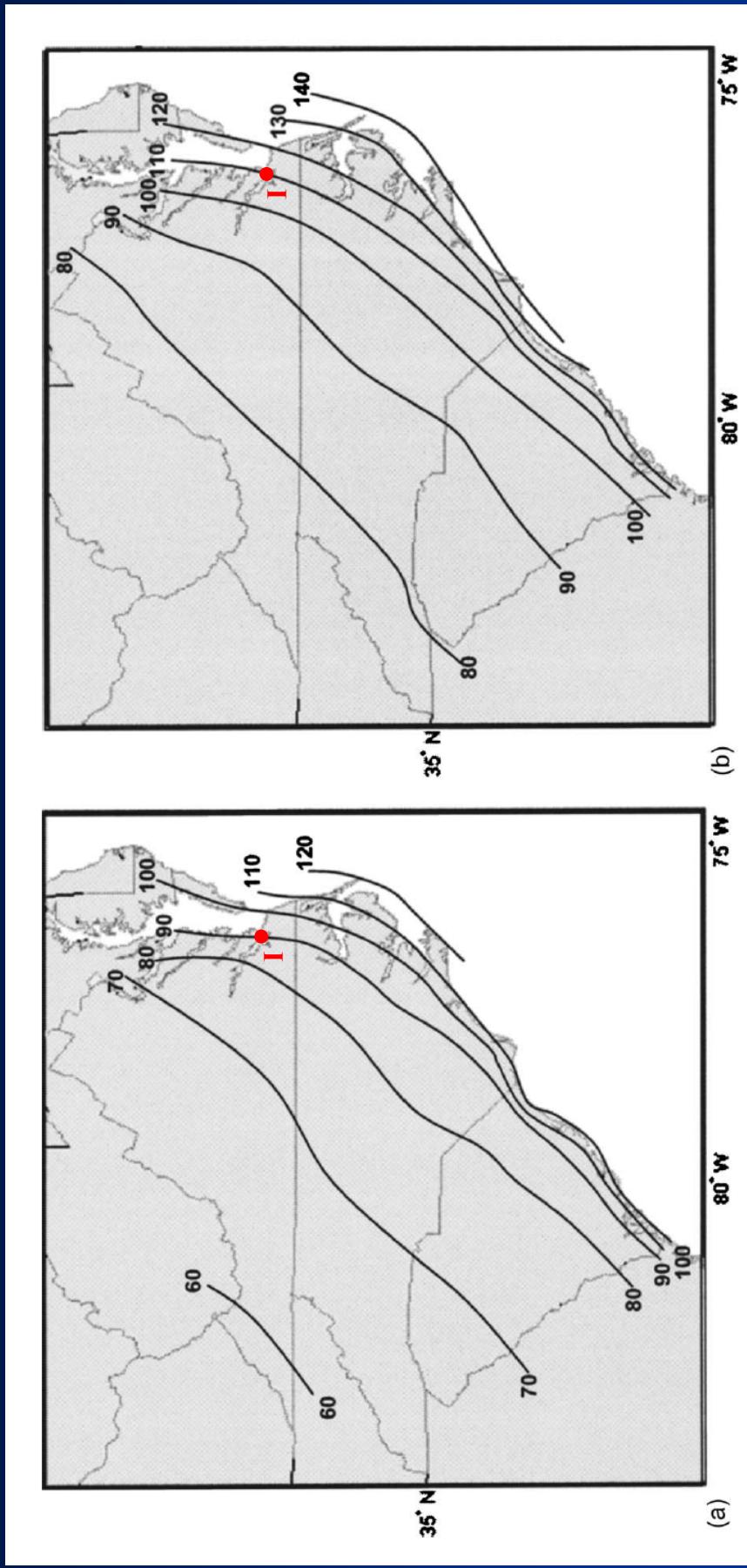


# Virginia Concept for Staged NOWTC with Progressively More Extreme Storm Conditions



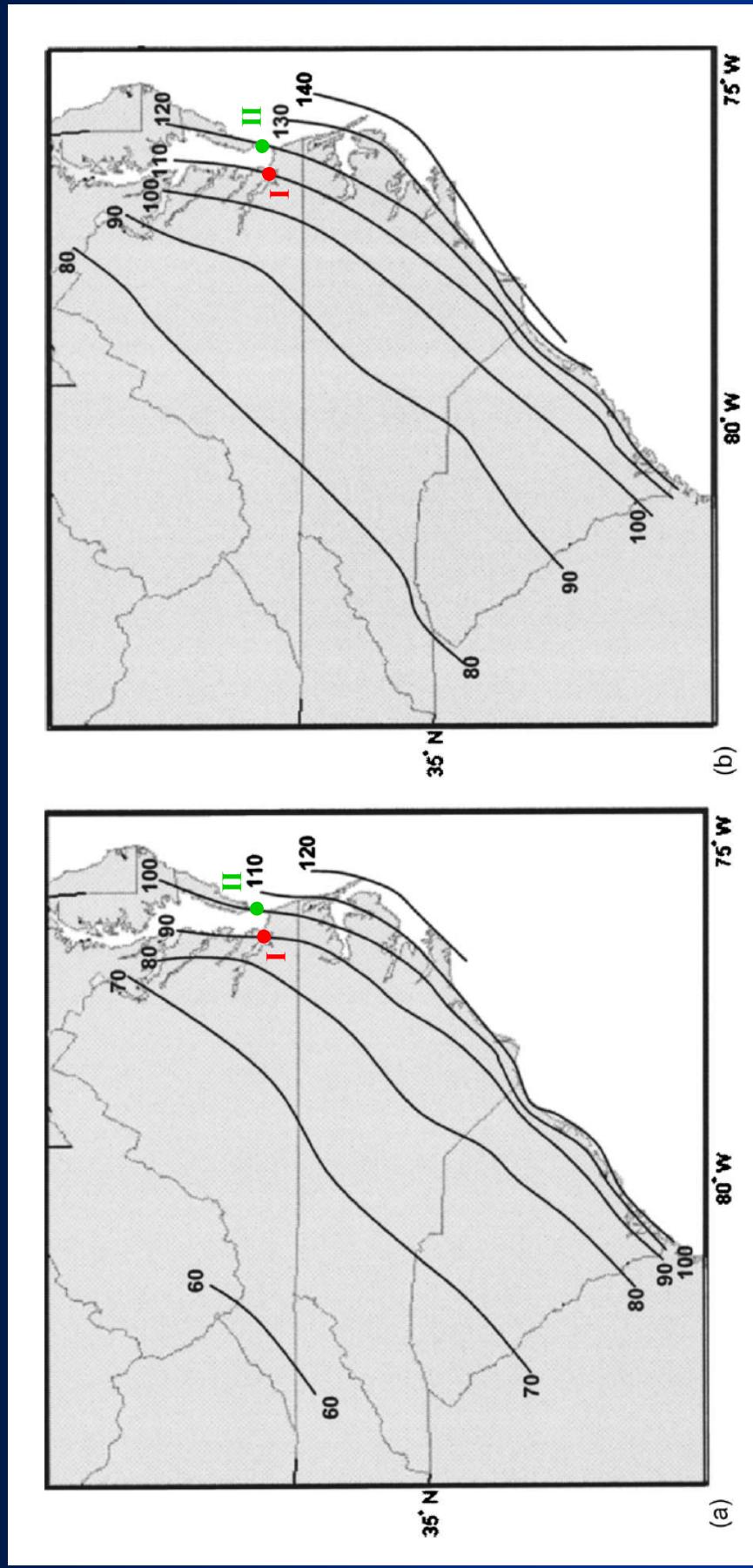
Hurricane 5-second gust wind speeds at 10 m above ground level over open terrain, in statute miles per hour (mph; 1 mph = 0.869 knots = 0.447 m/sec = 1.61 km/hr) in VA, NC, and SC at mean storm recurrence intervals of (a) 50 and (b) 100 years. Dividing the 5-second gust speed by 1.385 yields the 10-minute mean wind speed over open water. Wind speeds at an elevation of 10 m must be extrapolated to turbine hub height using hurricane shear profile coefficients.

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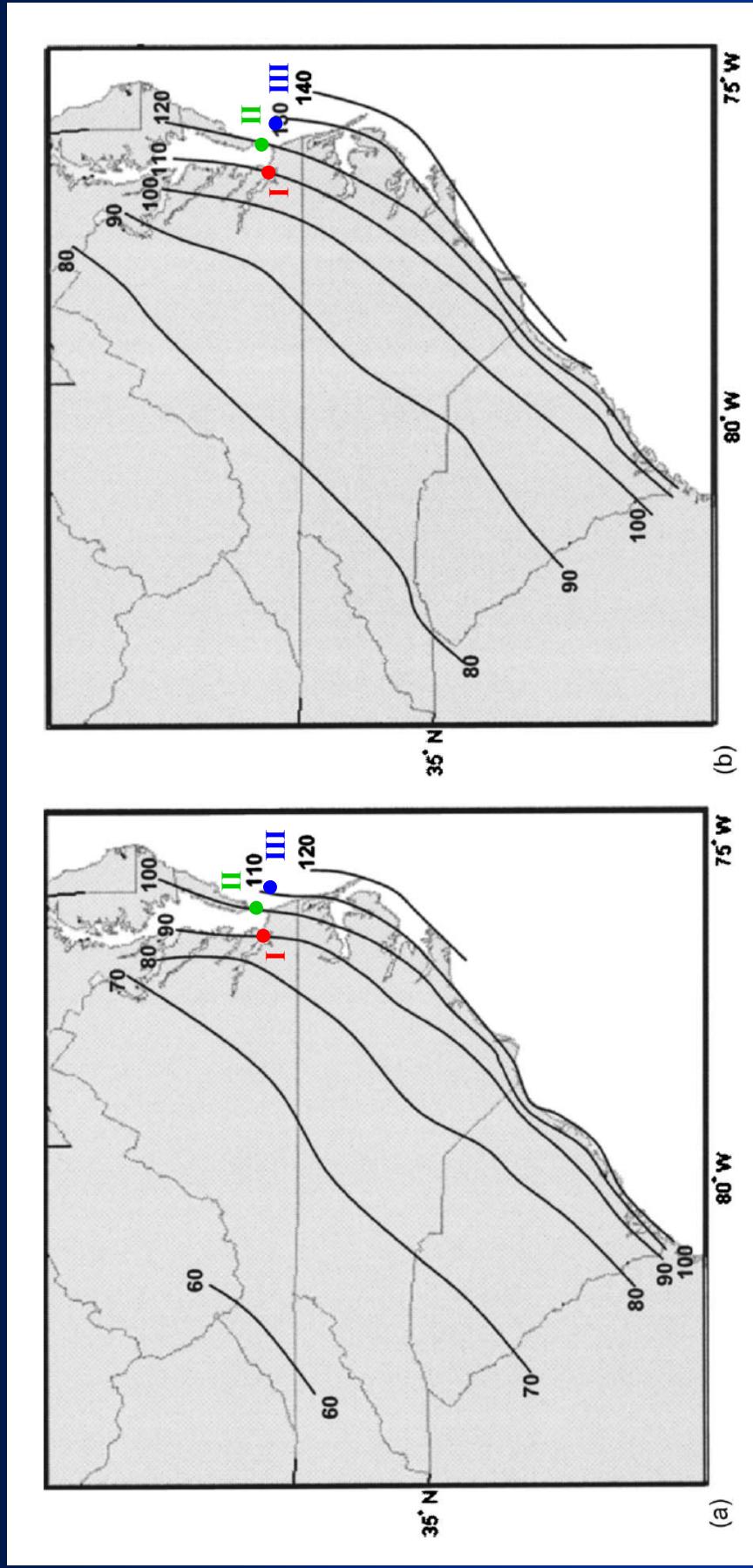
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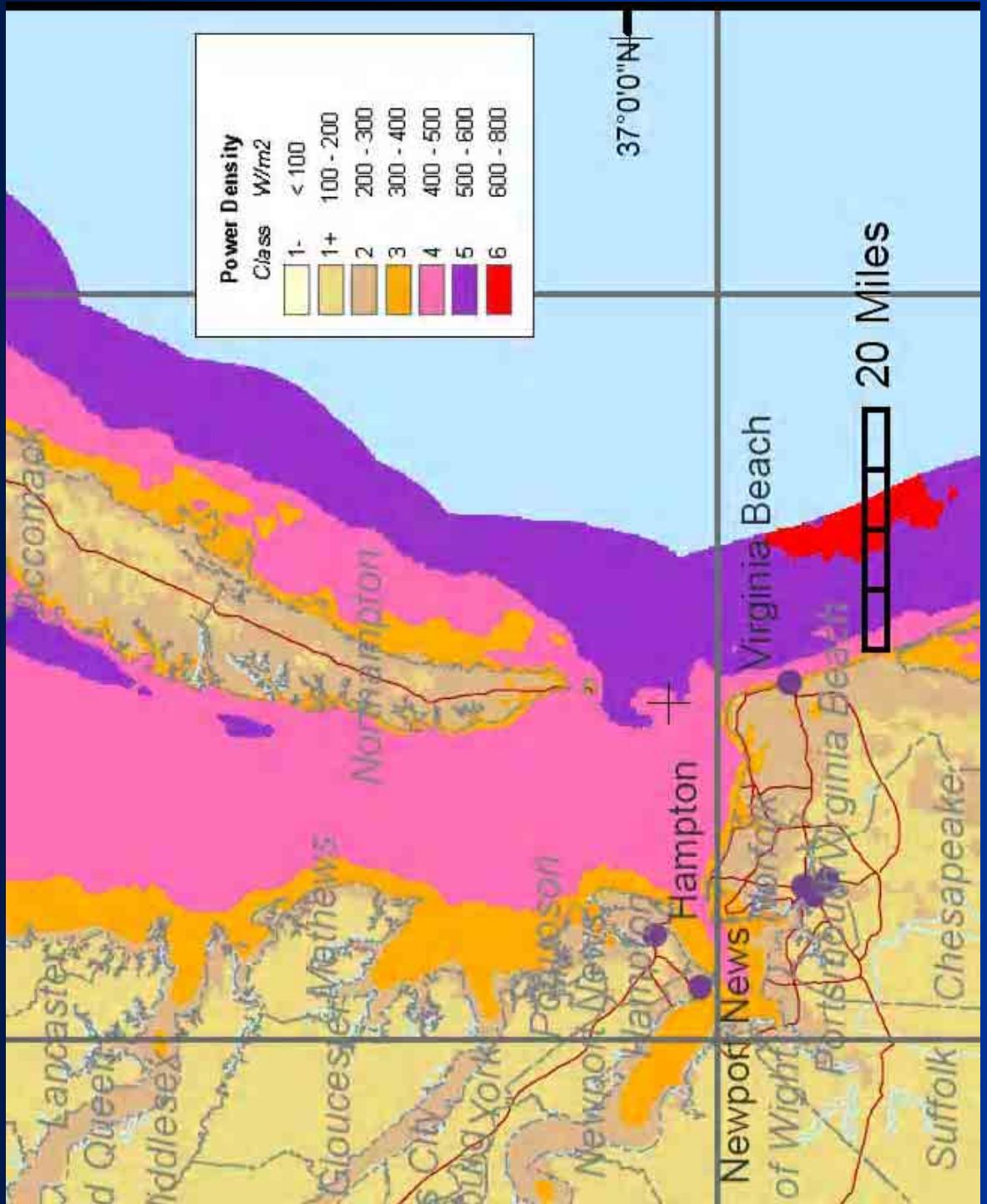
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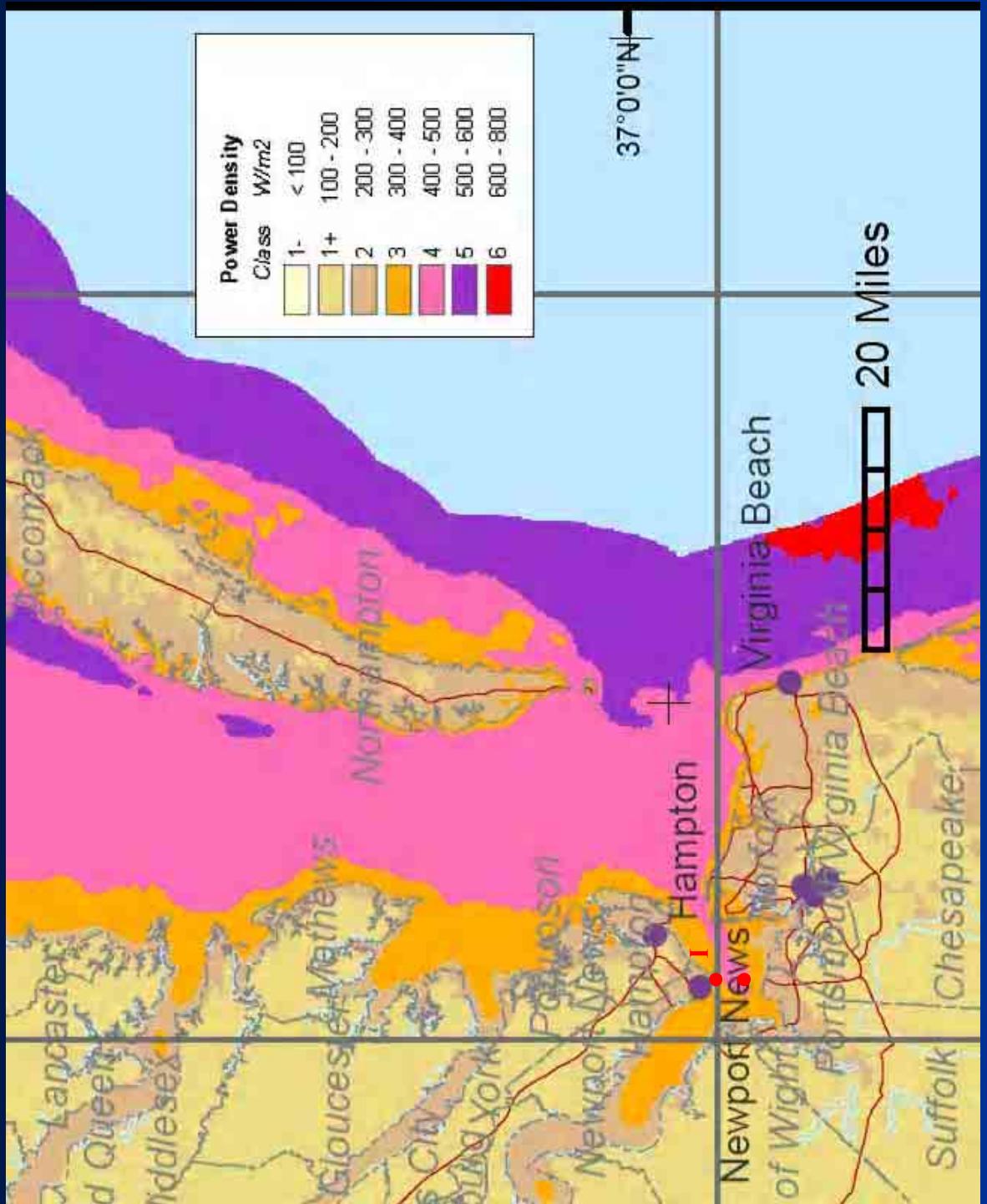


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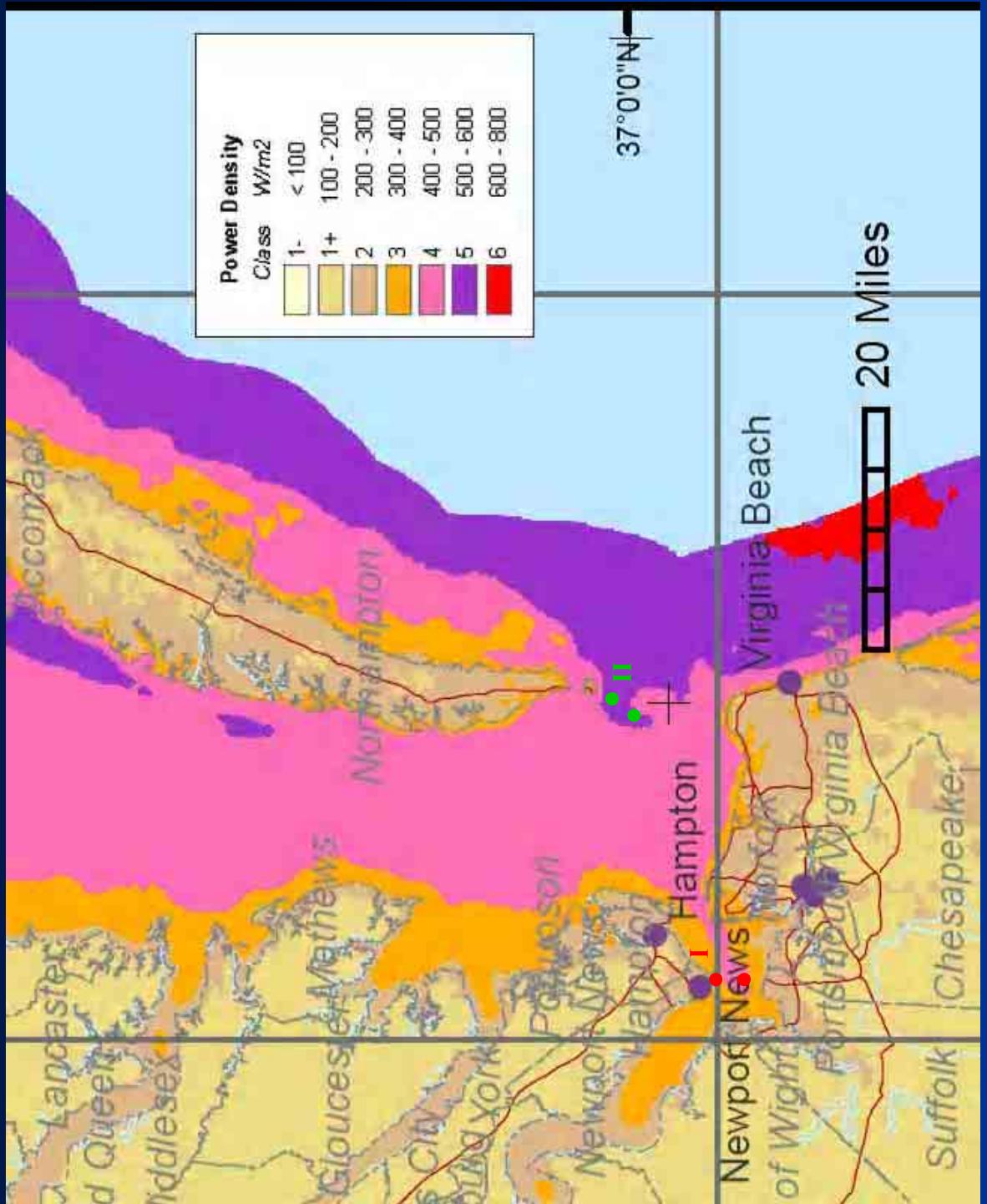
# Virginia Concept for Staged NOWTC with Progressively More Energetic Wind Resources



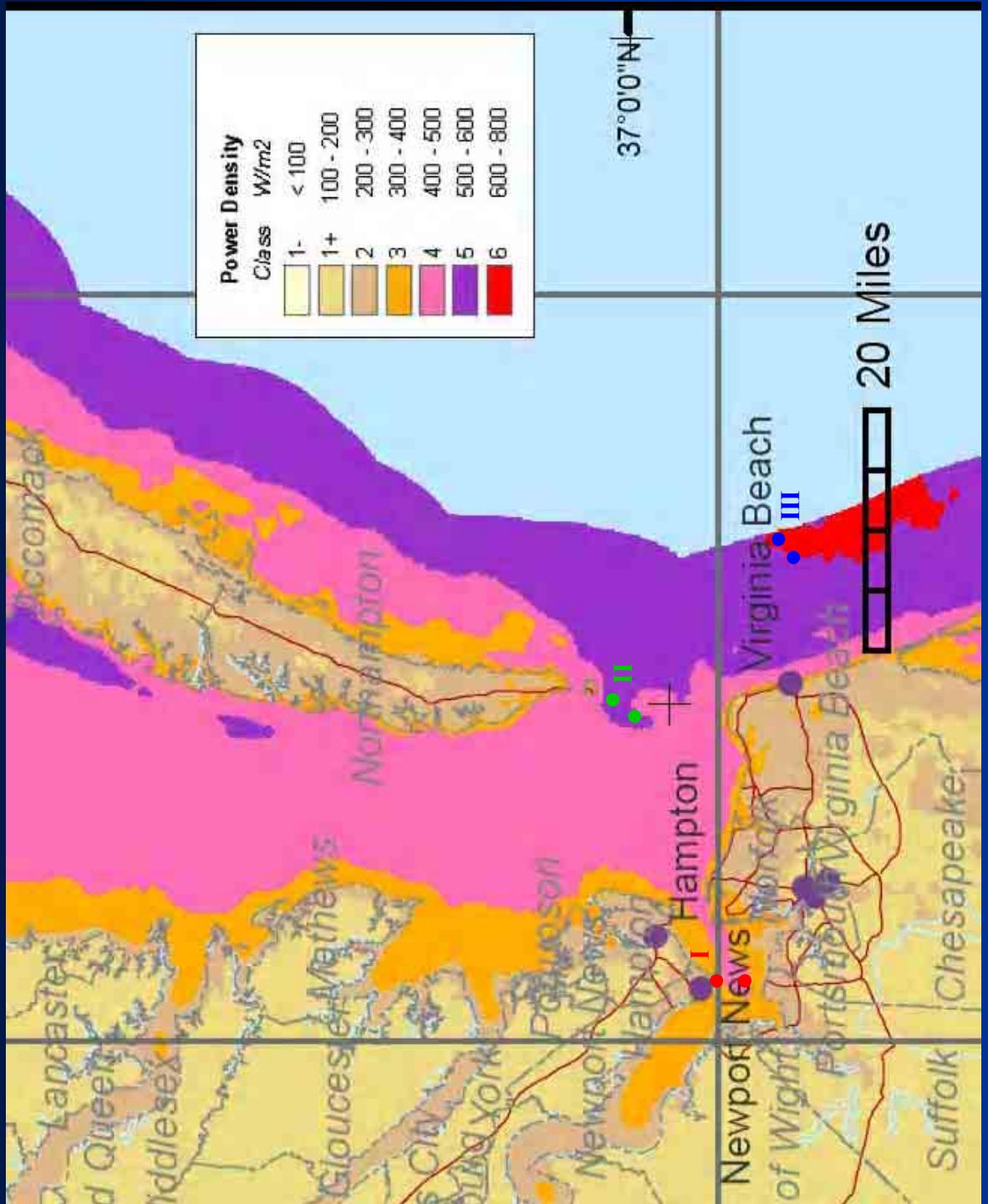
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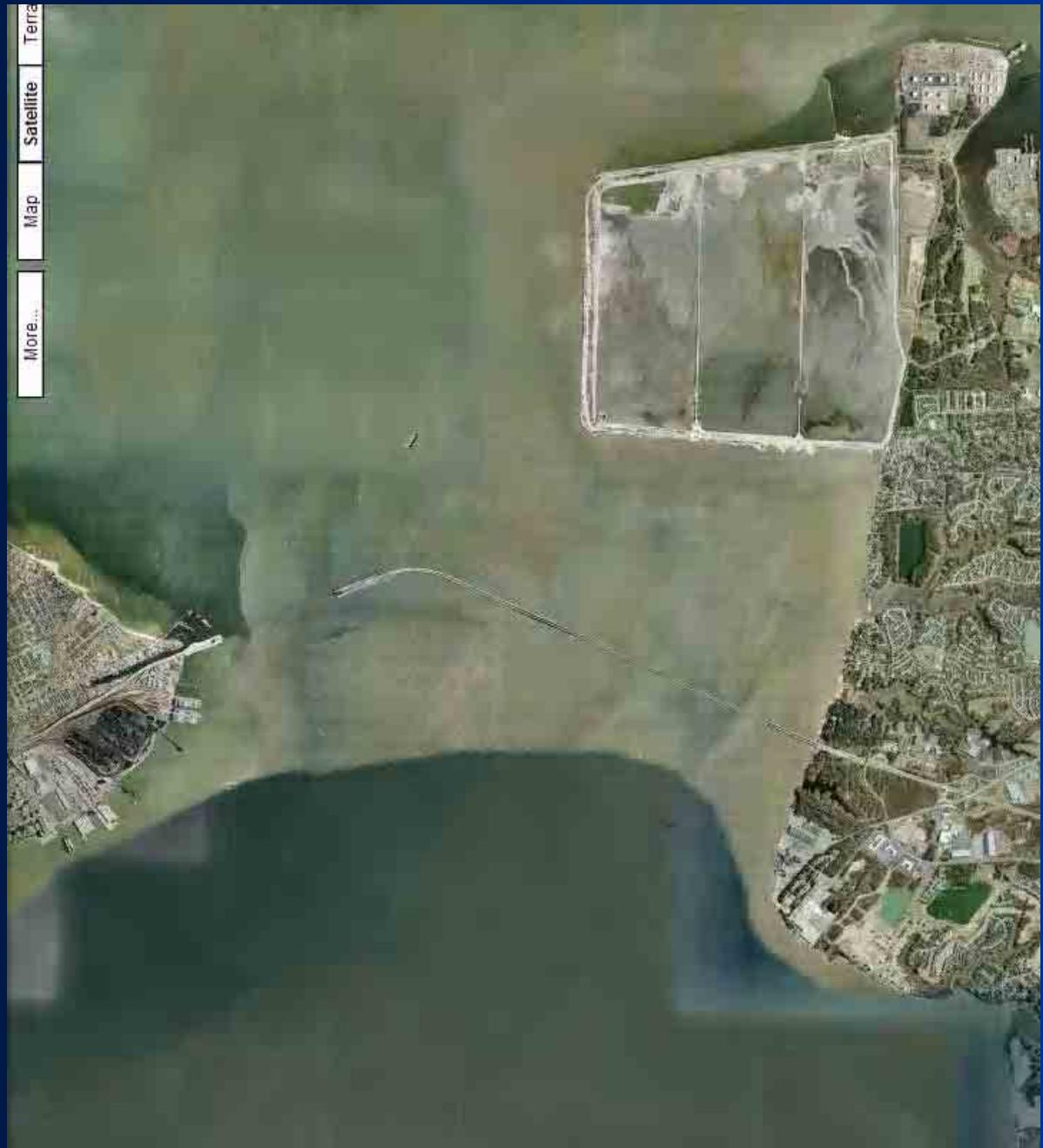
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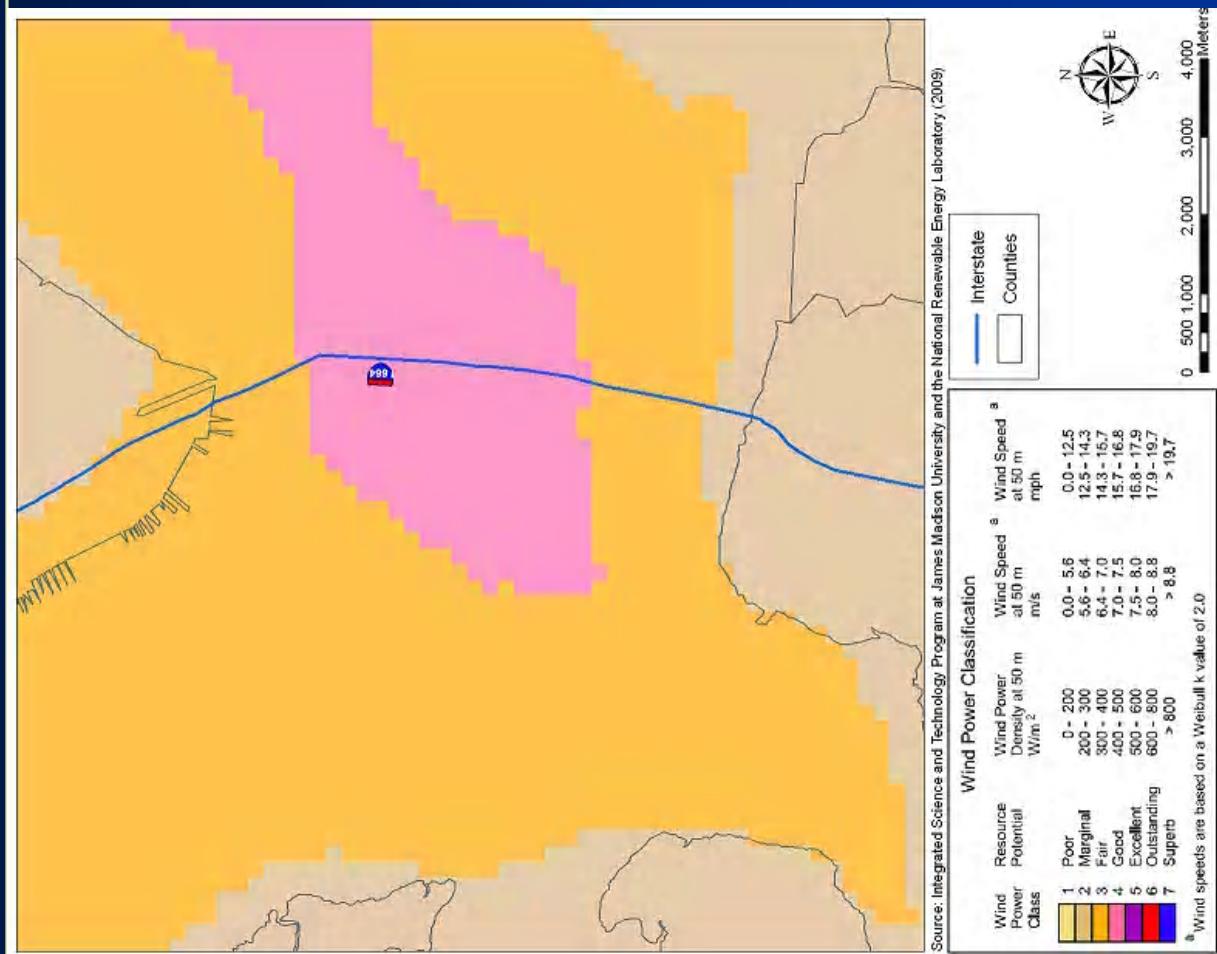
# Potential Stage I Test Pad Sites in State Waters by MMBT Crossing



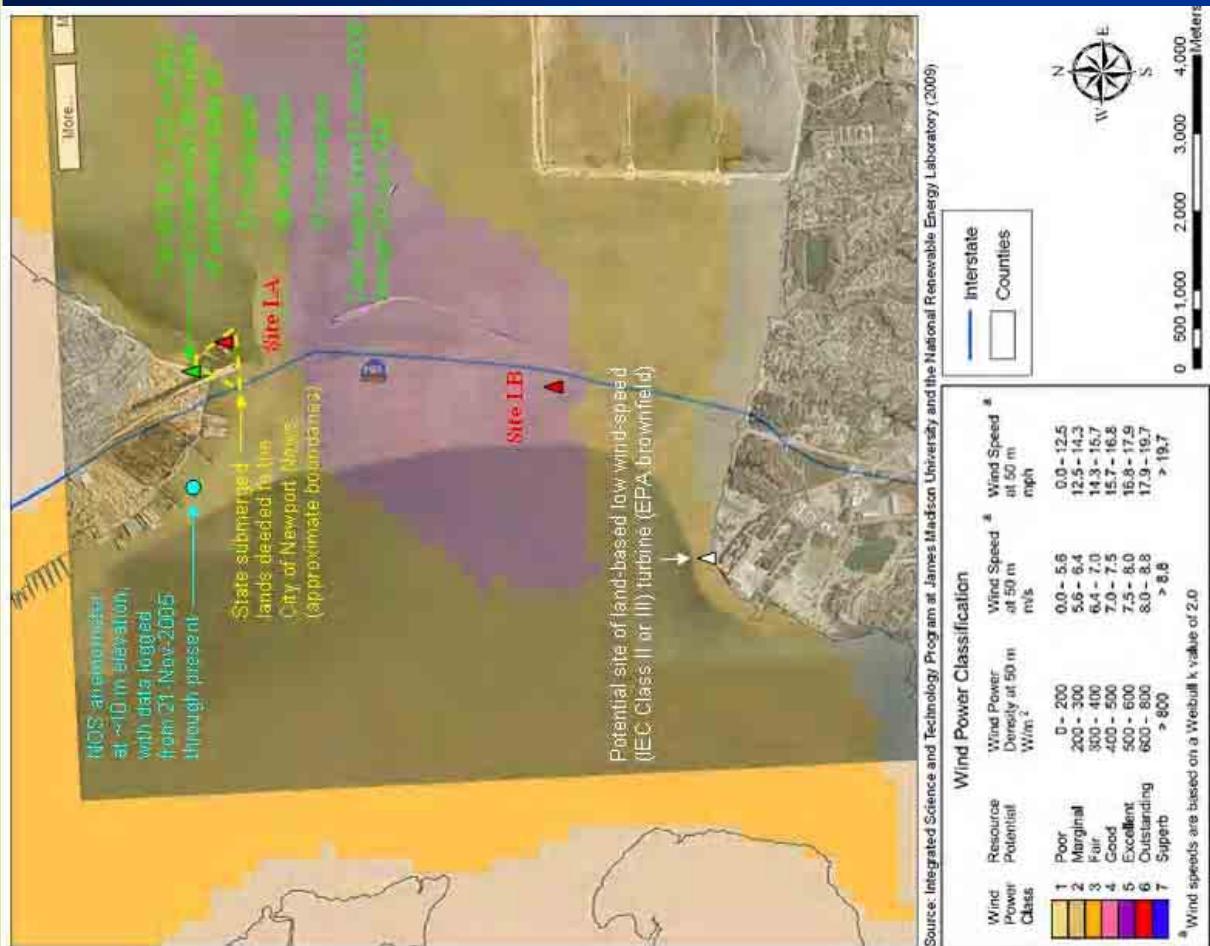
# Satellite Photo View of Stage I at Monitor-Merrimac Crossing of James River



# Wind Power Density Map of Stage I at Monitor-Merrimac Crossing of James River



# Potential Stage I Turbine Test Pad Sites at Monitor-Merrimac Crossing of James River



# State Submerged Lands Deeded to City of Newport News in 1965



# Nearshore Turbine might be Accessed by Pedestrian Footbridge



Location : IJsselmeer, North-East of Lelystad, The Netherlands

Client : NUON

Construction year : 1996

Wind turbines : 28 x Nordtank 600/44

50 m

Rotor hub height : Foundation engineering, manufacturing and installation

Ballast Nedam : Driven Monopile

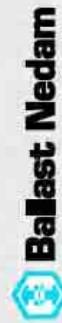
Foundation : 19 pcs. Ø 3515 mm, length 23 - 23,5 m, weight 60 ton

Dimensions : 9 pcs. Ø 3515 mm, length 23,6 - 24,6 m, weight 63 ton

30 m

Distance to shore : 1- 2 m

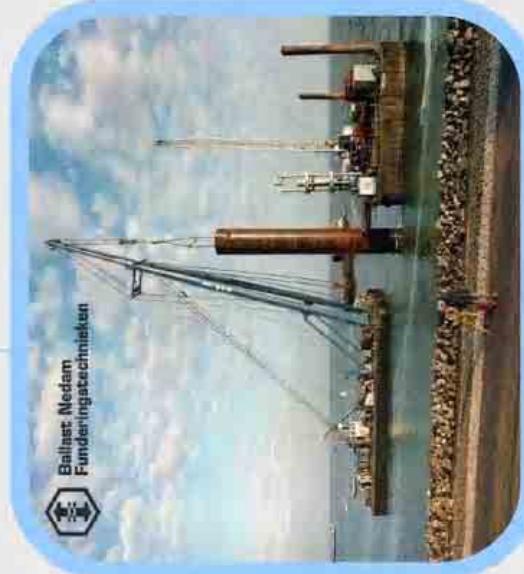
Water depth : 1- 2 m



**Ballast Nedam**

Offshore

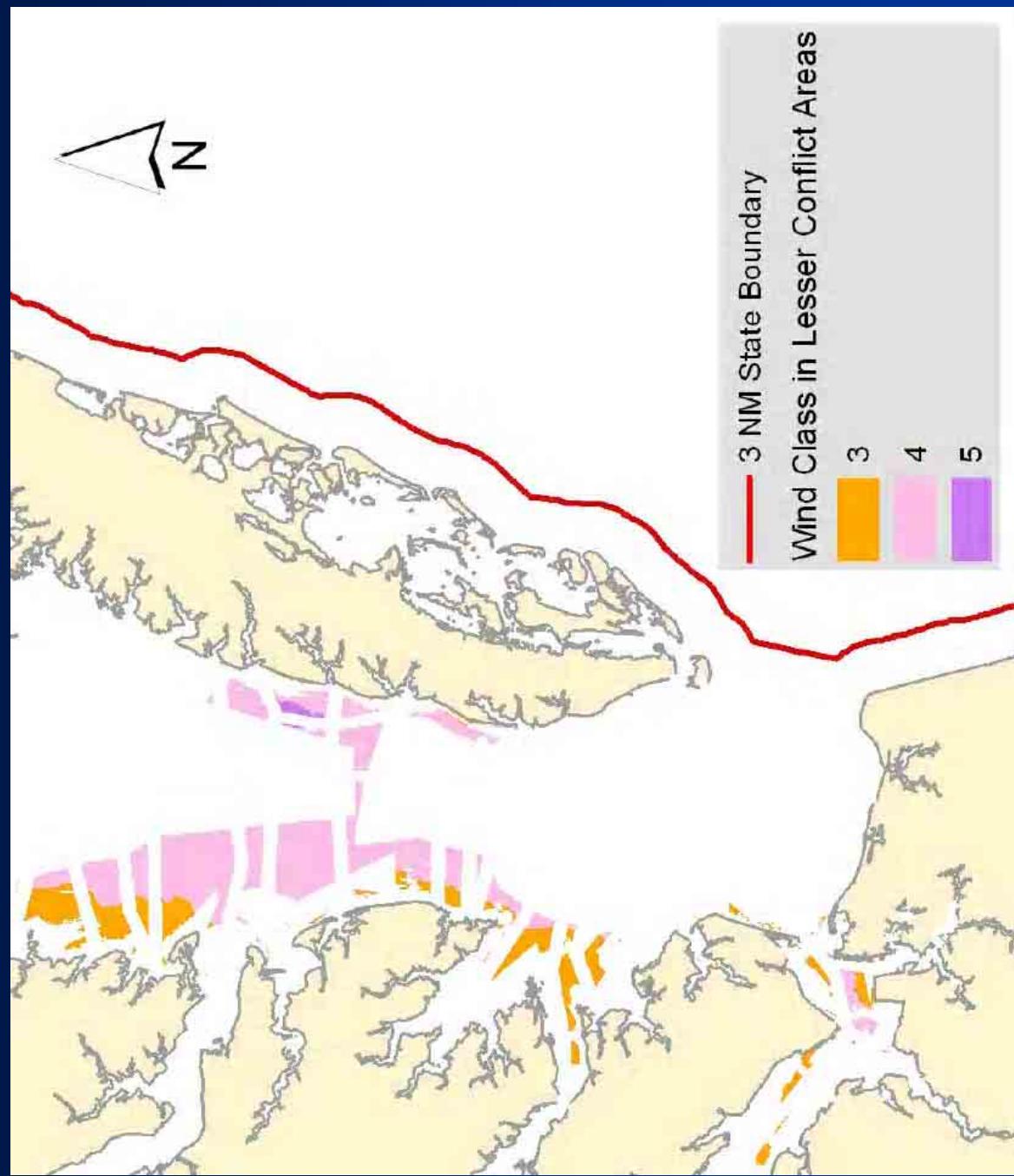
P.O. Box 1451  
3430 BL Nieuwegein  
The Netherlands  
Telephone +31 30 2 85 37 27  
Telefax +31 30 2 85 48 41  
[www.bnoffshore.com](http://www.bnoffshore.com)



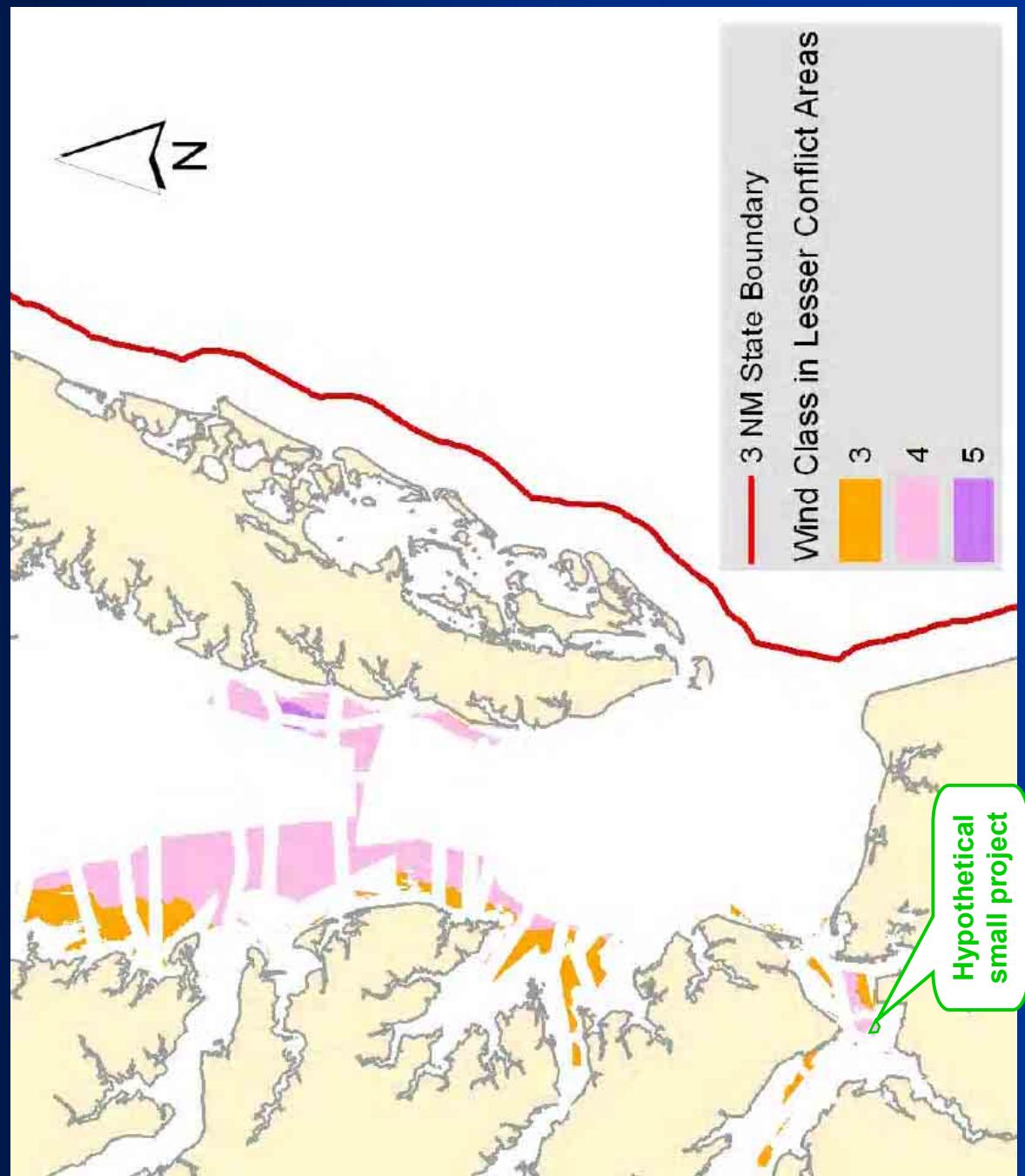
# Hypothetical Small Project in State Waters by MMBT Crossing



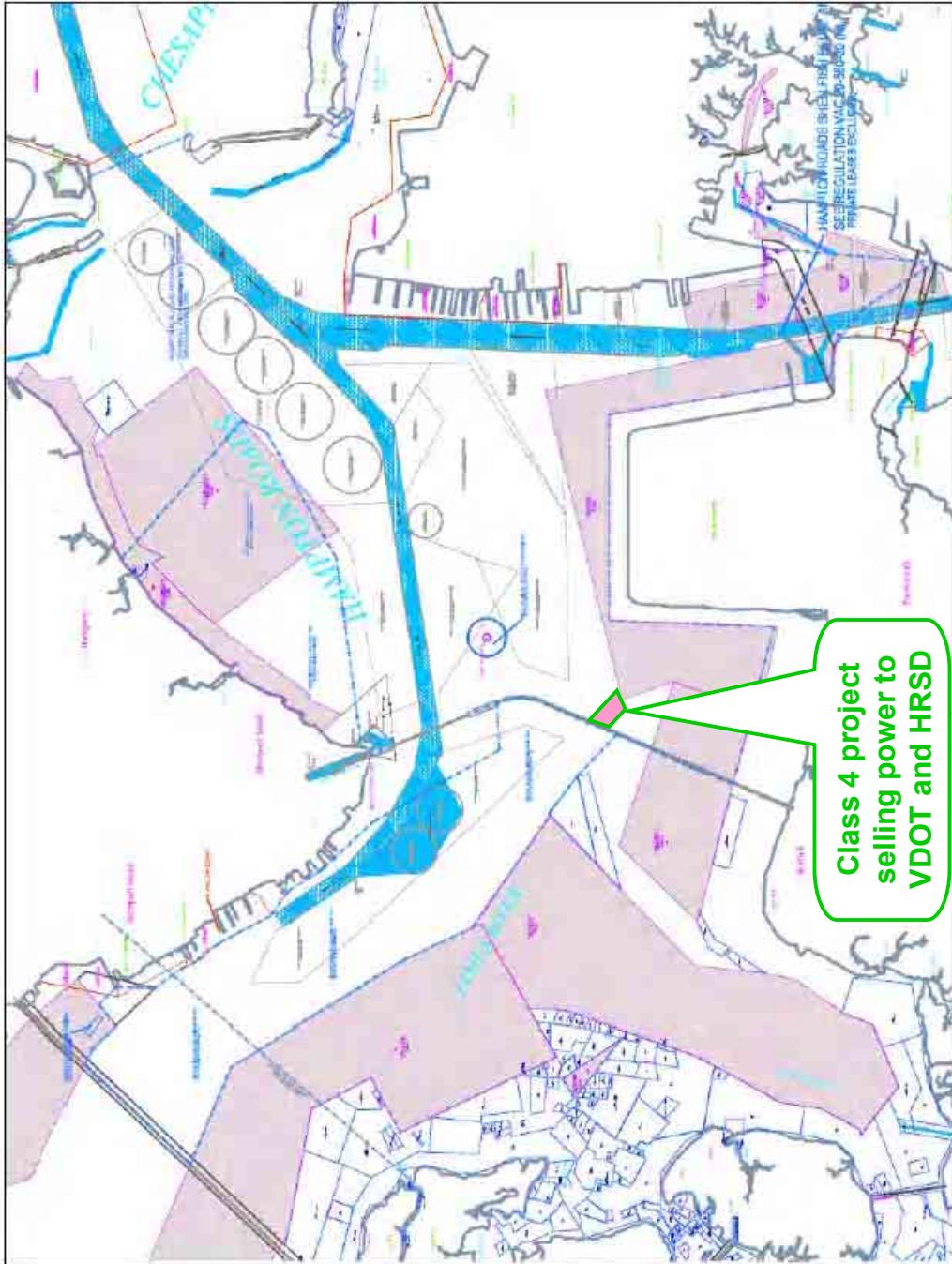
# Offshore Wind Resources in VMRC-Identified Lesser Conflict Areas



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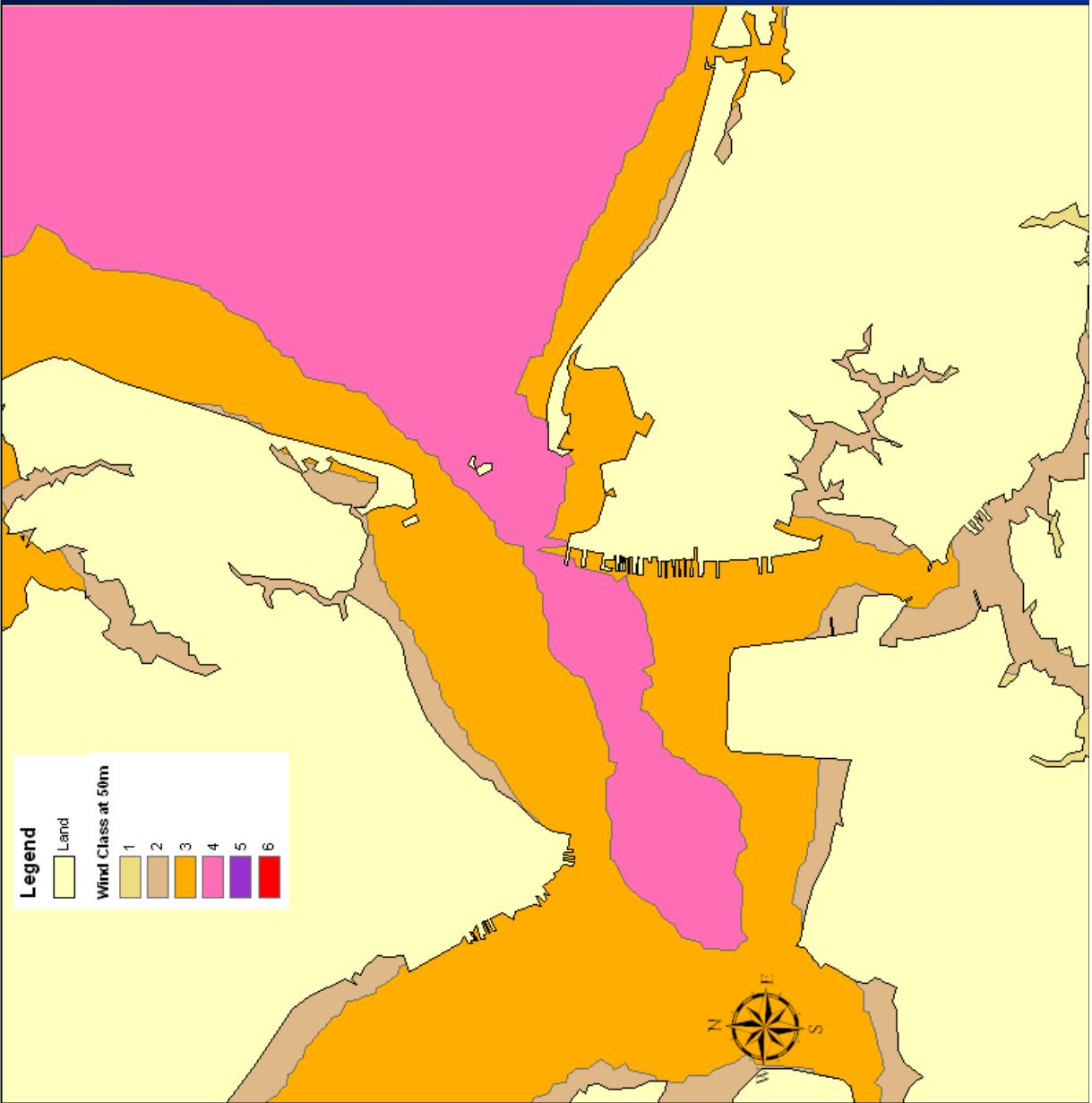


# Hypothetical Small Project can Avoid Conflicts

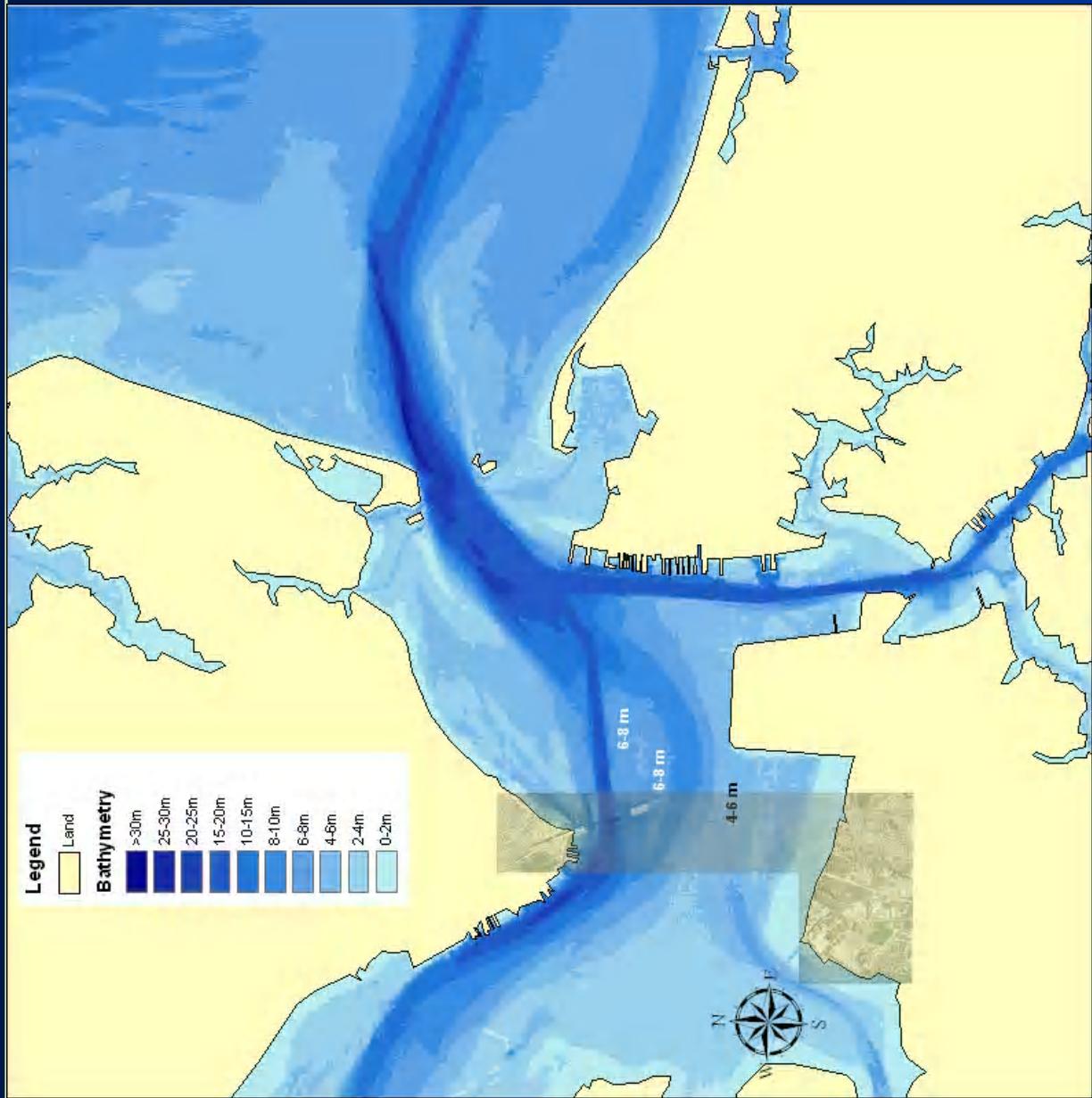


Hampton Roads area from the James River Bridge to the Hampton Roads Bridge-Tunnel. Map prepared by VMRC Engineering and Surveying Department.

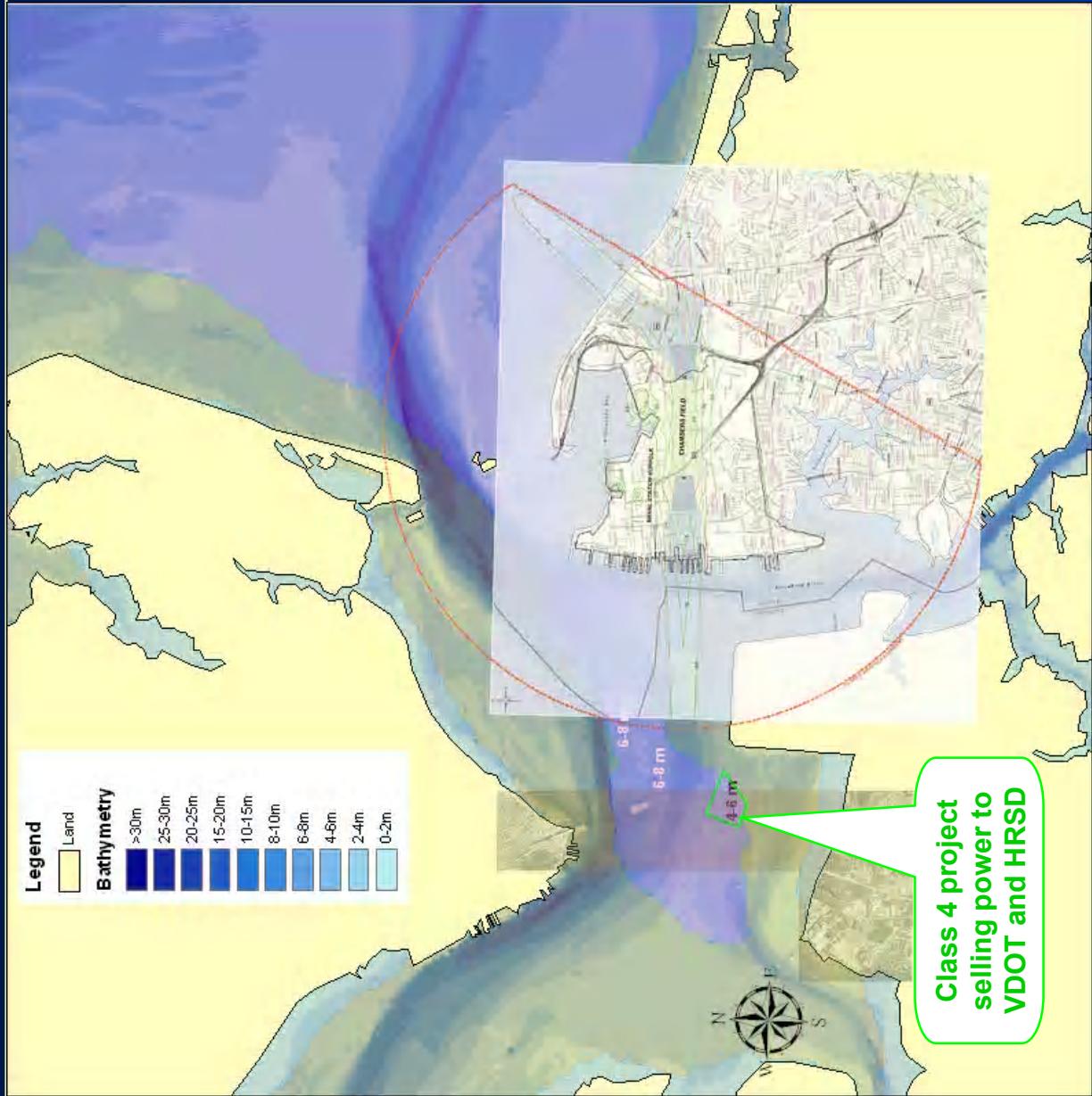
# James River Offshore Wind Classes



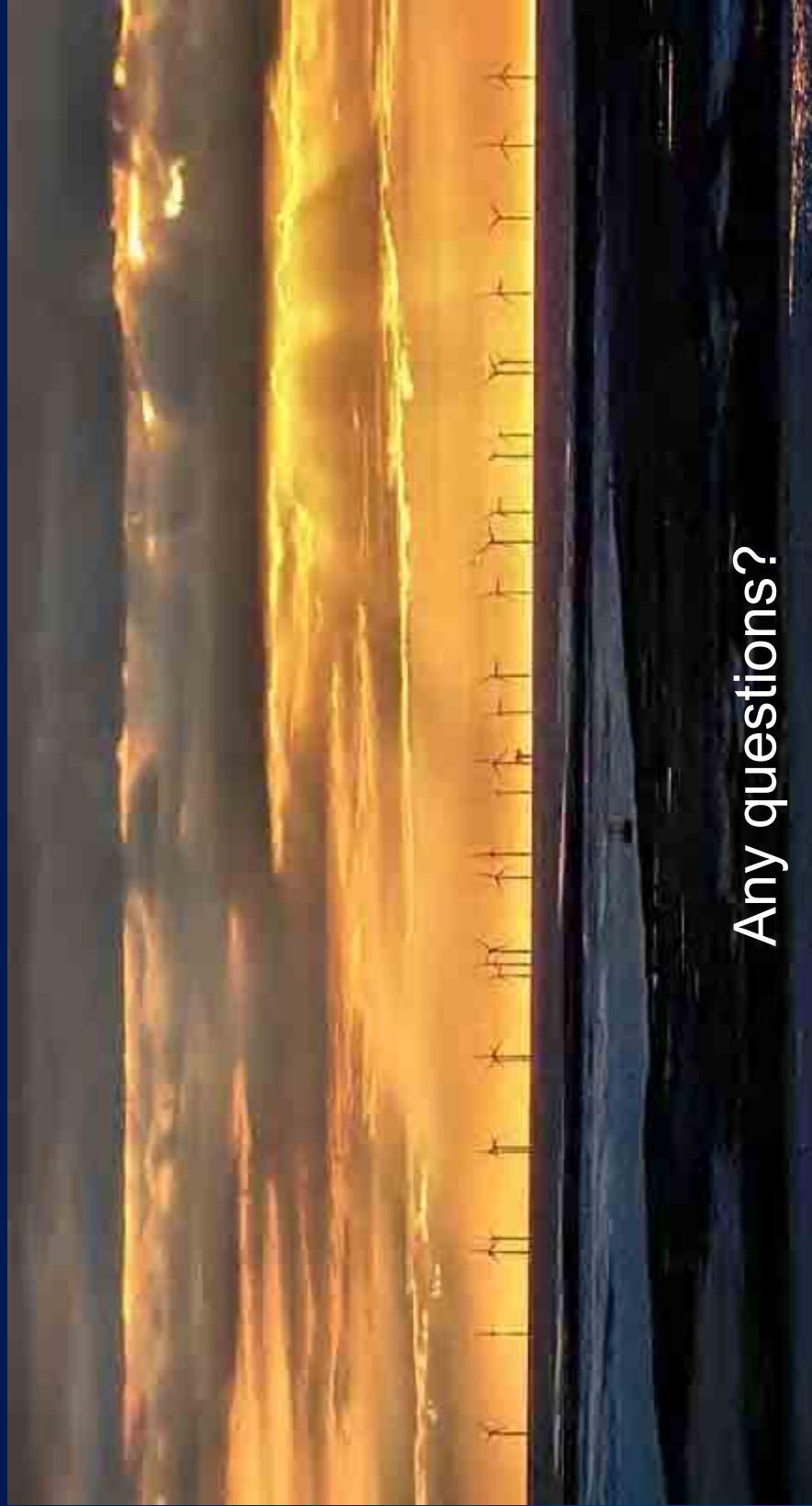
# James River Bathymetry



# James River Hypothetical Small Project



**Thank You!**



Any questions?

Email: [hagerman@vt.edu](mailto:hagerman@vt.edu)